

CLAIMS

- 1 1. A beam refraction apparatus, comprising:
2 an input fiber that carries an input beam;
3 a wavelength dispersive element coupled to the input fiber, the
4 wavelength dispersive element spreading the input beam in at least one
5 dimension as a function of wavelength and generating a dispersed beam;
6 a controllable grating reflecting the dispersed beam to the
7 wavelength dispersive element and generating a recombined beam, the
8 controllable grating providing a controllable reflectivity as a function of
9 wavelength;
10 an output fiber that receives the recombined beam; and
11 a collimating optical member coupled to the input and output fibers
12 that passes the input beam and the recombined beams in parallel and
13 opposite directions.
- 1 2. The apparatus of claim 1, wherein the collimating optical
2 member is a dual fiber collimator.
- 1 3. The apparatus of claim 1, wherein the collimating optical
2 member includes a prism.
- 1 4. The apparatus of claim 1, wherein the collimating optical
2 member includes a pair of mirrors.
- 1 5. The apparatus of claim 1, wherein the collimating optical
2 member includes at least one cylindrical lens.
- 1 6. The apparatus of claim 1, further comprising:
2 a walk-off crystal positioned adjacent to the collimating optical
3 member.

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1 7. The apparatus of claim 6, further comprising:
2 a half-wave plate positioned adjacent to the walk-off crystal.

1 8. The apparatus of claim 1, further comprising:
2 a reflector positioned along an optical path of the collimating optical
3 member, the reflector directing at least a portion of the input beam to the
4 controllable grating.

1 9. The apparatus of claim 1, wherein the reflector is a turning
2 mirror.

1 10. The apparatus of claim 1, wherein the wavelength dispersive
2 element includes at least one microelectromechanical device.

1 11. The apparatus of claim 10, wherein the
2 microelectromechanical device includes one or more micro mirrors.

1 12. The apparatus of claim 10, wherein the
2 microelectromechanical device includes one or more cantilevers.

1 13. The apparatus of claim 10, wherein the
2 microelectromechanical device includes one or more light controlling
3 devices.

1 14. The apparatus of claim 10, wherein the
2 microelectromechanical device includes one or more one or more
3 deformable grating modulators.

1 15. The apparatus of claim 1, wherein the controllable grating is
2 an array with a diffraction efficiency that is controlled as a function of
3 position on the array.

1 16. The apparatus of claim 1, wherein the controllable grating is
2 an array of ribbons.

1 17. The apparatus of claim 1, wherein the controllable grating is
2 a micromachined grating device.

1 18. The apparatus of claim 1, further comprising:
2 a lens positioned between the wavelength dispersive element and the
3 controllable grating.

1 19. A beam refraction apparatus, comprising:
2 an input fiber that carries an input beam;
3 a wavelength dispersive element coupled to the input fiber, the
4 wavelength dispersive element spreading the input beam in at least one
5 dimension as a function of wavelength and generating a dispersed beam;
6 a controllable grating reflecting the dispersed beam to the
7 wavelength dispersive element and generating a recombined beam, the
8 controllable grating providing a controllable reflectivity as a function of
9 wavelength;
10 an output fiber that receives a first portion of the recombined beam
11 from the controllable grating;
12 a detector array positioned to receive a second portion of the
13 recombined beam from the controllable grating.

1 20. The apparatus of claim 19, further comprising:
2 a focusing lens positioned between the detector array and the
3 controllable grating.

1 21. The apparatus of claim 20, further comprising:

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2 a collimating optical member coupled to the input and output fibers
3 that passes the input beam and the first portion of the recombined beams in
4 parallel and opposite directions.

1 22. The apparatus of claim 19, wherein the wavelength
2 dispersive element includes at least one microelectromechanical devices.

1 23. The apparatus of claim 22, wherein the
2 microelectromechanical device includes one or more micro mirrors.

1 24. The apparatus of claim 22, wherein the
2 microelectromechanical device includes one or more cantilevers.

1 25. The apparatus of claim 22, wherein the
2 microelectromechanical device includes one or more acousto-optic
3 modulator.

1 26. The apparatus of claim 22, wherein the
2 microelectromechanical device includes one or more light controlling
3 devices.

1 27. The apparatus of claim 22, wherein the
2 microelectromechanical device includes one or more one or more
3 deformable grading modulators.

1 28. The apparatus of claim 19, wherein the controllable grating is
2 an array with a diffraction efficiency that is controlled as a function of
3 position on the array.

1 29. The apparatus of claim 19, wherein the controllable grating is
2 an array of ribbons.

1 30. The apparatus of claim 19, wherein the controllable grating is
2 a micromachined grating device.

1 31. A dynamic channel equalizer, comprising:
2 an input fiber that carries an input beam;
3 a wavelength dispersive element coupled to the input fiber, the
4 wavelength dispersive element spreading the input beam in at least one
5 dimension as a function of wavelength and generating a dispersed beam;
6 a controllable grating reflecting the dispersed beam to the
7 wavelength dispersive element and generating a recombined beam, the
8 controllable grating providing a controllable reflectivity as a function of
9 wavelength;
10 an output fiber that receives a first portion of the recombined beam
11 from the controllable grating; and
12 a beam expander coupled to the input fiber makes the input beam
13 and makes it larger in one direction and compresses the output beam.

1 32. The apparatus of claim 31, wherein the wavelength
2 dispersive element includes at least one microelectromechanical device.

1 33. The equalizer of claim 32, wherein the
2 microelectromechanical device includes one or more micro mirrors.

1 34. The equalizer of claim 32, wherein the
2 microelectromechanical device includes one or more cantilevers.

1 35. The equalizer of claim 32, wherein the
2 microelectromechanical device includes one or more light controlling
3 devices.

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1 36. The equalizer of claim 32, wherein the
2 microelectromechanical device includes one or more one or more
3 deformable grating modulators.

1 37. The apparatus of claim 31, wherein the controllable grating is
2 an array with a diffraction efficiency that is controlled as a function of
3 position on the array.

1 38. The apparatus of claim 31, wherein the controllable grating is
2 an array of ribbons.

1 39. A dynamic spectral compensation spparatus, comprising:
2 a sensor that measures power in a selected spectral region and
3 produces a signal in response to the measured power; and
4 a dynamic gain equalizer that receives the signal from the sensor,
5 and modifies the selected spectral region by attenuation in a wavelength
6 dependent manner until the selected spectrum region reaches a target
7 spectrum, wherein the selected spectrum region is modified in response to
8 the received signal.